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ABSTRACT

This report is intended to help Michigan's vocational and technical teachers and administrators make decisions regarding the purchase of microcomputer hardware and software for professional use. Addressed in a discussion of computer hardware are current and planned inventories of microcomputer hardware located in the public vocational and technical facilities in Michigan, mainframe accessibility, and trends in the networking of microcomputers in the state. An examination of the uses of software in Michigan covers the following topics: identified activities (administrative, instructional support, and general instructional activities) and software use in vocational programs (agricultural, business, distributive, health occupations, home economics, and trade and industrial education). Provided next is a software guide that includes a source guide, a description of the state's tri-county computer consortium, and lists of software available in each of the above-mentioned educational program areas. A summary of the major findings of the hardware and software and a list of recommendations concerning the use of microcomputer hardware and software conclude the repo[illegible]. (MN)

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MICROCOMPUTER & SOFTWARE USE IN MICHIGAN'S VOCATIONAL-TECHNICAL FACILITIES: A STATUS REPORT (SUMMER 1983)

by

Richard Harris
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Ferris State College
Big Rapids, Michigan

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

The Center for Occupational Education offers an exciting and dynamic approach to meeting the needs of vocational education in the eighties and nineties. Because of the rapid changes in technology, along with new and emerging occupations, an up-to-date and well-trained cadre of vocational education personnel is needed to meet these demands throughout Michigan and the nation. In addition, ensuring the occupational competence of teachers, assessing student achievement and developing student leadership potential, are major priorities in maintaining quality vocational education. At Ferris State College, the Center for Occupational Education is meeting these demands with three major components which are autonomous—yet interrelated and complementary to one another: Vocational Teacher Preparation, the Michigan Occupational Competency Assessment Center, and the Vocational Industrial Clubs of America. Collectively, the Center offers seven primary services: (1) **Vocational Teacher Preparation** provides pre-service and in-service teacher preparation; (2) **Instructional Development** complements the instructor preparation activity through the development of instructional guides and other curricular aids; (3) **Industrial Trainer Preparation** equips personnel from business and industry with the most up-to-date methods of instruction and training; (4) **Personnel Development** provides a variety of activities for the entire vocational education community; (5) **The Student Occupational Competency Achievement Testing** (SOCAT) Program offers an exciting State of the Art approach to assessing student achievement in vocational education through nationally developed and pilot tested examinations; (6) **The Michigan Occupational Competency Assessment Center** (MOCAC) provides teacher and industrial testing in vocational education; and (7) **The Vocational Industrial Clubs of America** (VICA) offers an avenue for technical skill recognition and student leadership development through a vocational youth organization. The mission of the Center for Occupational Education is to provide the finest services possible to vocational education.

TABLE OF CONTENTS

	Page
Title Page	i
Table of Contents	ii
Abstract	iii
Introduction and Acknowledgements	iv
Part I - Hardware	
Current Inventory	1
Planned Inventory	10
Mainframe Accessibility	19
Networking of Microcomputers	19
Part II - Software	
Identified Activities	
- Administrative	23
- Instructional Support	24
- General Instruction	25
Narrative Summary of Respondents' Remarks	26
Software Use in Vocational Programs	
- Agriculture Education	29
- Business Education	31
- Distributive Education	33
- Health Occupations Education	35
- Home Economics Education	37
- Trade-Industrial and Technical Education	39
Part III - Software Guide	
Vocational Education Software Guide	41
- Source Guide	42
- Description of Tri-County Computer Consortium	43
- Agriculture Education	44
- Business Education	45
- Distributive Education	51
- Health Occupations Education	52
- Home Economics Education	53
- Trade-Technical Education	55
Major Findings	64
Recommendations	66

Microcomputers & Software Use in Michigan's
Vocational-Technical Facilities:
A Status Report
(Summer 1983)

by
Richard Harris
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ABSTRACT

This report is intended to help Michigan's vocational-technical teachers and administrators make decisions regarding the purchase of microcomputer hardware and software for professional use. The study provides data analysis for both vocational area centers and post-secondary facilities in Michigan, with respect to the following:

- Inventory or microcomputer hardware currently in use.
- Estimate of planned expansion, in terms of both hardware acquisition and networking approaches.
- Identifies, in detail, the various administrative and instructional activities now making use of microcomputers.

The report also includes a title index of readily available microcomputer software that relates to vocational instruction. This index can serve as a matrix to cross-reference software titles with applicable hardware.

The analysis is based upon a survey of eighty publicly supported occupational education facilities conducted during the Spring of 1983. A ninety-eight percent response from those queried provides a high degree of credibility to the thirty-four tables included in this report.

The software title index was derived from a review of five software source publications and five computerized data bases. It is organized by the major vocational education service groups (Agriculture, Business Education, Distributive Education, Home Economics, Health Occupations, and Technical-Industrial Education), and is not intended to infer quality or appropriateness to curriculum for citations listed.

The report concludes with a listing of general findings and recommendations that should be of interest to all Michigan vocational educators. The broad implications should also be of interest to vocational educators on a national basis. This is primarily because of the tremendous impact microcomputers are having upon training and the workplace throughout the country.

Microcomputers and Software Use in Michigan's
Vocational-Technical Facilities:
A Status Report
(Summer 1983)

INTRODUCTION AND ACKNOWLEDGEMENTS

The purpose of this investigation was to assess the current status of microcomputer use in Michigan's public vocational-technical education facilities. It is hoped data obtained from this survey will prove useful to vocational administrators and instructional staff when making decisions relative to purchasing microcomputer systems hardware and software.

Additionally, the Center for Occupational Education at Ferris State College can be aided in their ongoing professional education curriculum development efforts, particularly with respect to computer literacy and high technology for vocational educators. These new development efforts are planned to meet the challenges of both pre-service and in-service activities as Michigan undertakes its economic recovery plan. This economic recovery plan includes new horizons in high technology job training ventures as a top priority item.

The strategy implemented was threefold in nature. The first major aspect was to conduct a microcomputer hardware survey. Part one of the instrument was designed to: (a) inventory microcomputer hardware in use, (b) estimate planned purchases, and (c) identify, as clearly as feasible, the various networking approaches both in use and under consideration.

The second major aspect of the study was an assesment of microcomputer software applications. This part of the survey instrument was designed to: (a) determine amount of utilization for administration, instructional support and general instruction, (b) identify, as clearly as feasible, specific software programs in the above, and (c) determine the extent and scope of software applications for each major vocational education service group (e.g. Agriculture, Business Education, Distributive Education, Health Occupations, Home Economics, Trade and Industrial, and Technical).

The third major aspect was to conduct a search of commercially available software developed for, or applicable to, vocational instruction. The primary thrust was to create a listing for those vocational program areas traditionally serviced by Ferris State College. These areas are Health Occupations Education, Business and Distributive Education, and Trade-Technical Education.

Note: Although the compiled index does include listings for all vocational education service groups, citations for Agriculture and Home Economics are rather limited.

The outcome of this search produced an abbreviated index to serve as a matrix to cross reference titles of several commercially available and public domain software programs with available hardware. There was no attempt to assess the quality of these programs, it was merely a title review of several data bases and published software guides.

Note: Several programs for Home Economics were reviewed with recommendations in a separate project by the Michigan Vocational-Technical Education Services. This listing is included in the index.

In the early Spring of 1983, the survey instrument was mailed to area vocational center building principals and the occupational deans or directors in Michigan's publicly supported post-secondary facilities. Only a very few comprehensive high schools were included in the mailing to avoid the potential of mixing academic microcomputer applications with the vocational-technical data. A total of eighty-two questionnaires were forwarded and within thirty days (which included an interim reminder), all but two respondents were accounted for. This phenomenal return rate (98%) was the first indication of the strong interest and identified need for this type of survey. Additionally, it verifies a positive sense of professional responsibility by these administrators.

A note of special acknowledgement and thanks for professional assistance goes to Sid Sytsma, Director of Academic Computing at Ferris State College. Sid gave of his time and talents unselfishly to make sure the efficiency and value of microcomputers were illustrated in the outcome of the survey. Many others throughout Michigan and at the National Center for Research in Vocational Education, Columbus, Ohio, gave of their time and professional expertise these past several months. A listing of their names and titles is included at the end of this introduction.

This listing of names reflects many hours of travel and interviewing time which has provided the investigator considerable insight with respect to emerging challenges that microcomputer technology has upon all of education but particularly that which is vocational. These professionals provided many leads and identified new directions by their suggestions and encouraging comments. Unfortunately, much of this led into unexplored avenues, identifying the need for further research, assessment, and development. Priority areas include the need to organize the tremendous variety of available sources to locate new and untested software with vocational education implications; the close relationship microcomputers have with many job training objectives within areas of high technology; and their close tie-in with robotics in tomorrows workplace.

Input from the vocational educators interviewed has provided much supporting rationale bolstered by statistical data and related readings to develop the final recommendations. The dramatic impact that microcomputers are having upon education may be a passing technological fad but the odds are against it. More than likely they will be as commonplace in the schools of tomorrow as the overhead projector is today and the chalkboard was a generation ago. The following excerpt taken from a recent newspaper article reinforces this probability factor:

> "Computers are already available to about one in three U.S. public schools according to a 1982 survey by the National Center for Educational Statistics in the U.S. Department of Education," Columbus Dispatch, May 8, 1983.

Related applications of this new technology are having unanticipated impact on a significant number of vocational and industrial training programs. An article titled "Boom in Educational Robots Sparked by Schools, Industry," illustrates the trend is not limited to administrative word processing and accounting applications in education.

> "Industrial robots may be in a sales slump, but educational robots are booming. Demand from schools and industry for training in the latest manufacturing methods has drawn a dozen companies into the business of making and selling small, inexpensive robots and other models of automated factory equipment." Wall Street Journal, May 13, 1983.

Microcomputer technology with its phenomenal impact is not without its problems. Foremost among them are the need to identify appropriate usable software and the need for a variety of emerging support services. The following statements summarize recent observations by authorities monitoring the action:

> "Several major publishers recently paid huge advances for books about computer software. Among the most notable was Doubleday and Company's $1.3 million winning bid for 'The Whole Earth Software Catalog'." From an article titled "Publishers Rush to Software Books, Trying to Cash in on Computers" by Susan Chace, The Wall Street Journal, May 18, 1983.

> "Marc Tucker, a Washington D.C. analyst of classroom policies, recommends that schools should allot only 25% of their computer funds to hardware and maintenance. Another 25% should be reserved for software. The remaining 50% should go for planning, teacher training and other support services." From an article titled "Many Schools Buying Computers Find Problems Using Them" by Burt Schorr, The Wall Street Journal, April 7, 1983.

As far reaching as this is upon education, it is probable that the impact will be even greater in America's workplace, therefore, doubling its relative importance upon vocational curriculums. Judy Rodenstein in an article titled "Microcomputers in Vocational Education: Not Just a Teaching Tool" states:

> "By 1990, 75 out of every 100 workers in the U.S. will use a computer as part of their day-to-day occupational routine. Many of them will work as computer operators, systems analysts, or programmers--computing professions that come immediately to mind. But technology is also changing the way:
>
> --farmers manage farms
> --nutritionists prepare diets
> --retail workers keep track of inventory
> --construction contractors figure the cost of building a new home"
>
> Electronic Learning, March, 1983.

In summary, this report is an attempt to assess what is happening with microcomputer technology in Michigan's public vocational-technical programs today and provide predictions for next year. The data confirms that the impact is significant and consistent with the national trend. It is important that the implications be taken seriously by all vocational educators.

List
of
Professionals Interviewed During the Investigation

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Dr. Harrison Gardner, Professor
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Lansing, Michigan

Dr. Bruce Grow, Specialist
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Part I

Microcomputer Hardware

CURRENT INVENTORY (SPRING 1983)

The first component of this study was to acquire an inventory of microcomputer hardware located in the public vocational-technical facilities in Michigan. A listing of twenty-nine different models was received (see Table 1). Secondary vocational centers indicated that Apple II microcomputers were the highest inventory group with Radio Shack units ranking second (TRS 80-III), third (TRS 80-1), and fourth (TRS 80-II) (see Table 2). There were twenty-eight Commodore-Pet units in the secondary facilities, which provided it with a fifth place ranking.

Post-secondary vocational-technical facilities also indicated that Apple II microcomputers were the highest inventory group (see Table 3). The second highest was Commodore-Pet units, third highest was Radio Shack model TRS 80-II, and the Blackhawk microcomputer ranked fourth. The IBM personal computer ranked fifth in the post-secondary inventory.

Combining the inventories from both secondary and post-secondary facilities produced a composite rank order with Apple II units remaining at the top (see Table 4). Commodore-Pet microcomputers rated second, Radio Shack TRS 80-II third, TRS 80-III fourth, and Blackhawk fifth. This composite inventory ranked TRS 80-I sixth and IBM personal computer units seventh. Inventory numbers for other microcomputers dropped off significantly after the seventh ranking.

The inventory data was processed so that popularity of microcomputers by use in different facilities could be rank ordered. This was done by separate listings for each facility and determining how many facilities had at least one of a kind in use, thus allowing the analysis to differentiate between a large inventory in one facility and a mix of different inventories in several facilities.

TABLE 1

Inventory List of Microcomputer Hardware in Michigan's Vocational-Technical Facilities

Manufacturer/Model	Data Storage				Sub-total		
	Disc		Cassette		Sec.	Post-Sec.	Total
	Sec.	Post-Sec.	Sec.	Post-Sec.			
Apple II	100	202	-	-	100	202	302
Apple III	-	-	-	-	-	-	-
Atari	4	2	1	1	5	4	9
Blackhawk	-	83	-	-	-	83	83
Commodore-Pet	15	142	13	11	28	153	181
DecMate II	-	1	-	-	-	1	1
Dedicated Word Processor	-	6	-	-	-	6	6
Easy Cam	-	1	-	-	-	1	1
Exxon	5	-	-	-	5	-	5
Fortune	3	-	-	-	3	-	3
Heath/Zenith	1	-	-	-	1	-	1
IBM Data Master	5	2	-	-	5	2	7
IBM Display Writer	1	-	-	-	1	-	1
IBM Personal Computer	17	25	-	-	17	25	42
IMSAI	1	-	-	-	1	-	1
Lanier	2	-	-	-	2	-	2
Monroe-0629	1	-	-	-	1	-	1
North Star	2	2	-	-	2	2	4
O.S.I.	-	2	-	-	-	2	2
Tele-Video	1	18	-	-	1	18	19
Tectronix	-	1	-	-	-	1	1
TRS 80-I	16	14	35	-	51	14	65
TRS 80-II	35	88	-	-	31	88	123

TRS 80-III	91	16	-	-	91	16	107
TRS 80-16	2	1	-	-	2	1	3
Vector	1	2	-	-	1	2	3
XEROX 820	-	8	-	-	-	2	2
Z90/Zenith	-	10	-	-	-	10	10

TABLE 2

Rank Order of Secondary Area Center Inventory by Actual Count

n = 50

1.	Apple II	100
2.	TRS 80-III	91
3.	TRS 80-1	51
4.	TRS 80-II	35
5.	Commodore Pet	28
6.	IBM Personal	17
7.	Atari, Exxon and IBM DM	5 each
8.	Fortune	3
9.	North Star, Lanier, TRS 80-16	2 each
10.	Heath/Zenith, IMSAI, Monroe 0602, TeleVideo and Vector	1 each

TABLE 3

Rank Order of Post-Secondary Inventory by Actual Count

n = 30

1.	Apple II	202
2.	Commodore Pet	153
3.	TRS 80-II	88
4.	Blackhawk	83
5.	IBM Personal Computer	25
6.	Tele-Video	18
7.	TRS 80-III	16
8.	TRS 80-I	14
9.	Z90/Zenith	10
10.	Dedicated Word Processor	6

TABLE 4

Rank Order of Composite Inventory by Actual Count

n = 80

1.	Apple II	300
2.	Commodore Pet	181
3.	TRS 80-II	123
4.	TRS 80-III	107
5.	Blackhawk	83
6.	TRS 80-I	65
7.	IBM Personal Computer	42
8.	Tele-Video	19
9.	Z90 Zenith	10
10.	Atari	9

This popularity by facility distribution indicates that the Apple II microcomputer retains top ranking in both secondary and post-secondary facilities, which produces the same composite rating (see Tables 5 and 6). Radio Shack units remained the next most popular in secondary vocational facilities with the TRS 80-II ranking second, TRS 80-III third, and TRS 80-I fourth. The Commodore-Pet units ranked fifth, IBM Personal Computer sixth, Atari seventh, while North Star and Lanier micros tied for eighth. All others listed on Table 1 were located in one facility only.

Post-secondary vocational facility distribution indicates Blackhawk, Commodore Pet and TRS 80-II microcomputers all tying for the second place rank order. They are followed by TRS 80-I third, IBM Personal Computer fourth, and TRS 80-III fifth. Two models, the North Star and Vector, tied for sixth. All others were located in one facility only.

The composite rank order identified Radio Shack's TRS 80-II second after the top-ranked Apple II. The Commodore Pet and TRS 80-I tied for third ranking while the TRS 80-III was listed fourth. Fifth-ranked units involved a tie between Blackhawk unit and the IBM Personal Computer. Also tied for sixth place was the Atari and North Star; Lanier and Vector tied for seventh and bottom listing.

A composite analysis by manufacturer which grouped all the Radio Shack models together indicated that Apple II retained top ranking with at least one unit installed in 50 facilities (see Table 7). Radio Shack ranked second with an installation in 44 facilities. Popularity dropped off significantly at this point for other manufacturers.

TABLE 5

Popularity Rank Order by Facility Distribution

	Secondary	Number of Facilities		Post-Secondary	Number of Facilities
1.	Apple II	26	1.	Apple II	24
2.	TRS 80-II	10	2.	Blackhawk	9
3.	TRS 80-III	9	2.	Commodore-Pet	9
4.	TRS 80-I	7	3.	TRS 80-II	9
5.	Commodore-Pet	5	4.	TRS 80-I	7
6.	IBM Personal Computer	4	5.	IBM Personal Computer	5
7.	Atari	3	6.	TRS 80-III	3
8.	North Star	2	7.	North Star	2
8.	Lanier	2	7.	Vector	2
9.	All others listed on Table 1	1	8.	All others listed on Table 1	1

TABLE 6

Composite Popularity by Model

(Facility Distribution)

1.	Apple II	50 facilities
2.	TRS 80-II	19 facilities
3.	TRS 80-I	14 facilities
3.	Commodore-Pet	14 facilities
4.	TRS 80-III	11 facilities
5.	IBM Personal Computer	9 facilities
5.	Blackhawk	9 facilities
6.	Atari	4 facilities
6.	North Star	4 facilities
7.	Lanier	2 facilities
7.	Vector	2 facilities

TABLE 7

Composite Popularity by Manufacturer

(Facility Distribution)

Apple	50 facilities
Radio Shack	44 facilities
Commodore-Pet	14 facilities
IBM & Blackhawk	9 facilities
Atari & Northstar	4 facilities
Lanier & Vector	2 facilities

PLANNED INVENTORY (SPRING 1983)

An attempt was made to assess the future growth of microcomputer use in Michigan's vocational-technical facilities by determining additional units planned for purchase (see Table 8). The total listing identified twelve different models. This was a significant trend change from the twenty-nine models listed in the current inventory. Analysis determined that the Apple/Lisa microcomputer was the only addition, and a total of thirty-four units to be purchased were unidentified. The total inventory of 996 microcomputers (refer to Table 1) would be increased by a significant fifty-eight percent if the 581 units are actually purchased for the new school year (refer to Table 8).

Secondary vocational education facilities indicated that more TRS 80-III microcomputers would be purchased than any other type. The count outnumbered second-ranked Apple II by over a 2:1 ratio (see Table 9). Third-ranked IBM personal computers and fourth-place Heath/Zenith were both outranked by the Apple II by an approximate 3:1 ratio. Fortune microcomputers were ranked fifth while Atari and Blackhawk tied for sixth rank order. Radio Shack's TRS 80-16 was ranked seventh and the last twenty-two units were unidentified.

Both total numbers and rank order for post-secondary vocational-technical facilities were significantly different from secondary facilities in the planned purchase inventory, while the total inventory (see Table 9) indicated one hundred fifty for area centers. The planned total for post-secondary schools totaled four hundred thirty-one (see Table 10). In this inventory (post-secondary), Apple II ranked first, IBM Personal Computer second; both had rather large inventory numbers at one hundred eighty-one and one hundred four respectively. Radio Shack's TRS 80-II ranked third with thirty-one units, their model TRS 80-III was fourth with thirty units, and their model TRS 80-16 was fifth with twenty-six units. Planned purchase for twenty of the new Apple/Lisa microcomputers provides sixth place rank order. Commodore-Pet, Vector and Atari ranked seventh, eighth, and ninth respectively. Twelve units were unidentified in this portion of the survey.

TABLE 8

Planned Hardware Acquisition

Inventory List of Planned Hardware Purchases
for Michigan's Vocational-Technical Facilities

n = 80

Manufacturer/Model	Data Storage						
	Disc		Cassette		Sub-total		
	Sec.	Post-Sec.	Sec.	Post-Sec.	Sec.	Post-Sec.	Total
Apple II	29	181	-	-	29	181	210
Apple III	-	-	-	-	-	-	-
Apple/Lisa	-	20	-	-	-	20	20
Atari	3	5	-	-	3	5	8
Blackhawk	3	-	-	-	3	-	3
Commodore-Pet	-	15	-	-	-	15	15
DecMate II	-	-	-	-	-	-	-
Dedicated Word Processor	-	-	-	-	-	-	-
Easy Cam	-	-	-	-	-	-	-
Exxon	-	-	-	-	-	-	-
Fortune	6	-	-	-	6	-	6
HP 125	-	-	-	-	-	-	-
Heath-Zenith	10	-	-	-	10	-	10
IBM Data Master	-	-	-	-	-	-	-
IBM Display Writer	-	-	-	-	-	-	-
IBM Personal Computer	12	104	-	-	12	104	116
IMSAI	-	-	-	-	-	-	-
Lanier	-	-	-	-	-	-	-
Monroe-0620	-	-	-	-	-	-	-
North Star	-	-	-	-	-	-	-

Tele-Video	-	-	-	-	-	-	-
Tectronix	-	-	-	-	-	-	-
TRS 80-I	-	-	-	-	-	-	-
TRS 80-II	-	31	-	-	-	31	31
TRS 80-III	64	30	-	-	64	30	94
TRS 80-16	1	26	-	-	1	26	27
Vector	-	7	-	-	-	7	7
Unidentified	22	12	-	-	22	12	34

TABLE 9

Planned Hardware Purchases

Rank Order by Inventory Count

Secondary

1.	TRS 80-III	64
2.	Apple II	29
3.	IBM Personal Computer	12
4.	Heath/Zenith	10
5.	Fortune	6
6.	Atari	3
6.	Blackhawk	3
7.	TRS 80-16	1
8.	Unidentified	22
	Total	150

TABLE 10

Planned Hardware Purchases

Rank Order by Inventory Count

Post-Secondary

1.	Apple II	181
2.	IBM Personal Computer	104
3.	TRS 80-II	31
4.	TRS 80-III	30
5.	TRS 80-16	26
6.	Apple/Lisa	20
7.	Commodore-Pet	15
8.	Vector	7
9.	Atari	5
10.	Unidentified	12
	Total	431

The composite ranking of total units by model identified Apple II, IBM Personal Computer and TRS 80-III as the top three in that respective order (see Table 11). Dropping far behind was the TRS 80-II, TRS 80-16, and Apple/Lisa in that rank order (e.g., fourth, fifth, and sixth). The remaining rank order identified Commodore-Pet (seventh), Heath/Zenith (eighth), Atari (ninth), Vector (tenth), Fortune (eleventh), and Blackhawk (twelfth and last). There were a total of thirty-four unidentified units.

This portion (planned purchases) of the survey used the same data processing format as the current inventory, allowing a popularity-by-facility rank order to be identified. This analysis clearly illustrates that the Apple II remains the most popular microcomputer by facility distribution (see Tables 12 and 13). At the secondary level, Radio Shack's TRS 80-III model ranked second, IBM Personal Computer third, and Fortune fourth. Heath/Zenith microcomputer tied with the TRS 80-16 for fifth and last ranking.

Following closely behind Apple II, choices in post-secondary rankings were IBM Personal Computers; the number of facilities making the choice was eleven for the Apple II and nine for the IBM Personal Computer. Dropping far behind in facility distribution were Atari, Commodore-Pet, TRS 80-II, and TRS 80-III--all tied for third ranking with each having planned installations in two facilities. TRS 80-16, Vector and Apple/Lisa tied for fourth and last ranking; each were identified by one facility.

The composite popularity rank order identified the IBM Personal Computer following top-ranked Apple II. Radio Shack's TRS 80-III was ranked third (see Table 13). Dropping significantly behind in this rank order and tying for fourth was Atari, Commodore-Pet, Fortune and TRS 80-II. With installations in one facility each, the following were ranked fifth and last: Apple/Lisa, Heath/Zenith, Vector and TRS 80-16.

TABLE 11

Planned Hardware Purchases

Rank Order by Inventory Count

Composite

1.	Apple II	210
2.	IBM Personal Computer	116
3.	TRS 80-III	94
4.	TRS 80-II	31
5.	TRS 80-16	27
6.	Apple/Lisa	20
7.	Commodore-Pet	15
8.	Heath/Zenith	10
9.	Atari	8
10.	Vector	7
11.	Fortune	6
12.	Blackhawk	3
13.	Unidentified	34
	Total	481

TABLE 12

Planned Hardware Purchases

Popularity Rank Order by Facility Distribution

	Secondary			Post-Secondary	
1.	Apple II	9	1.	Apple II	11
2.	TRS 80-II	5	2.	IBM Personal Computer	9
3.	IBM Personal Computer	3	3.	Atari	2
4.	Fortune	2	3.	Commodore-Pet	2
5.	Heath/Zenith	1	3.	TRS 80-II	2
5.	TRS 80-16	1	3.	TRS 80-III	2
			4.	TRS 80-16	1
			4.	Vector	1
			4.	Apple/Lisa	1

TABLE 13

Planned Hardware Purchases

Popularity Rank Order by Facility Distribution

Composite

		Number of Facilities
1.	Apple II	20
2.	IBM Personal Computer	12
3.	TRS 80-111	7
4.	Atari	2
4.	Commodore-Pet	2
4.	Fortune	2
4.	TRS 80-II	2
5.	Apple/Lisa	1
5.	Heath/Zenith	1
5.	Vector	1
5.	TRS 80-16	1

A composite analysis by manufacturer, which grouped all Radio Shack models together, again illustrated Apple II retaining top ranking (see Table 14). Of interest, however, was the phenomenal second-place ranking of the relatively new IBM Personal Computer. The grouping of all Radio Shack's selections provided a very close third-place ranking. At this point all other selections dropped off significantly.

TABLE 14

Planned Hardware Purchases

Composite Popularity by Manufacturer

(Facility Distribution)

Apple	21
IBM Personal Computer	12
Radio Shack	10
Atari	2
Commodore-Pet	2
Fortune	2
Heath/Zenith	1
Vector	1

MAINFRAME ACCESSIBILITY

An inquiry was made to determine how many facilities had access to a mainframe terminal through its microcomputers. Twenty-five percent of the respondents indicated that they did have access, and all but three responded to a follow-up question (see Tables 15 and 16). This portion of the inquiry attempted to identify the major application areas. Analysis indicates that the strongest application is for instruction, a common instructional use in the teaching of BASIC, COBOL and FORTRAN computer languages. One respondent also noted having an individualized computerized instruction system, another noted a health education testing program. Another respondent stated that they have the capability but are not using it.

Other major applications were for administrative records and the Michigan Occupational Information System. The investigator was surprised that there were not more M.O.I.S. applications identified in the survey.

NETWORKING OF MICROCOMPUTERS

The trend to use a networking approach within a facility, district or geographic area is relatively new; therefore, a three-part question, similar to the inquiry about access to mainframe terminals, was included in the questionnaire. Almost one-half (48.5%) of the respondents indicated that either they were using or planning to use a networking approach (see Table 17). The second and third parts of the inquiry differentiated between systems currently in use (see Table 18) and planned networking systems (see Table 19). Three facilities noted that Network III systems were in use, and four indicated some type of instructional network had been implemented. One respondent indicated a CORVUS system was being used and another identified M.O.I.S. as a network descriptor.

Three respondents made comments that could not appropriately be included under the coded descriptors; they are: (1) tie-in with Detroit Public Schools network system, (2) extensive use of HP 3000 mini-computer with twenty terminals

TABLE 15

Access to Mainframe Through Microcomputers

n = 80

	Yes	No	No Response
Secondary	11	37	2
Post-Secondary	9	20	1
Composite	20	57	3

TABLE 16

If Yes in Table 15, The Descriptors Used to Describe Access

n = 80

	Secondary	Post-Secondary	Total
M.O.I.S.	1	1	2
Administrative Records	2	2	4
Instructional	5	4	9
IBM 34/MAINFRAME	0	1	1
Other	0	1	1
No Response	4	22	63

TABLE 17

Using or Planning to Use a Network Approach

n = 80

	Yes	No	No Response
Secondary	21	25	4
Post-Secondary	17	12	1
Composite	38	37	5

TABLE 18

If Yes in Table 17, the Descriptors Used to Describe Systems

n = 80

	Secondary	Post-Secondary	Total
M.O.I.S.	0	1	1
CORVUS	0	1	1
Network III	2	1	3
Instructional	1	3	4
Narrative Required	1	2	3
No Response	46	22	68

TABLE 19

n = 80

	Secondary	Post-Secondary	Total
Corvus	-	3	3
Omninet	-	1	1
REMC/SELMS	1	-	1
Network III	1	-	1
Instructional	3	1	4
IBM 34/Mainframe	3	-	3
Narrative Required	6	6	12
No Response	36	19	55

or printers attached, and (3) utilizing CPNET and MP/M. An OEM company developed a multi-use system for each of three micro labs. The local station operating system is CP/M. Running from two servers in each lab, a maximum of sixteen stations can be linked per network. Each lab has a total of twenty-three stations.

Part three of this inquiry (planned networking systems) received a variety of responses in addition to those included in coded form (refer to Table 19 and respondents' remarks). The descriptors cited in the table indicate three facilities are planning to use CORVUS networking, and three intend to network into available IBM/34 mainframe terminals. Four respondents indicated some type of instructional network system, and one each identified Network III, Omninent and REMC/SELMS.

Additional respondent remarks are:

Secondary Vocational-Technical Facilities:

- Internal multi-disc networking system to serve 15 units.
- Plan to network a group of TRS 80's for information processing.
- Planning to network into the intermediate school district system.
- Planning to tie-in with vocational programs at several different schools.
- Considering micro network system with hard disc.

Post-Secondary Vocational-Technical Facilities:

- Considering tie-in with nearby university mainframe or intermediate school district mainframe.
- Planning to consider when more software becomes available.
- Considering networking Apple II's with hard disc unit.
- Considering tie-in with the libraries of local higher education institutions.
- Considering tie-in of IBM micro's with IBM mainframe.

Part II

Microcomputers and Software

IDENTIFIED ACTIVITIES THAT INCLUDE MICROCOMPUTER INVOLVEMENT:

In order to determine the types of activities for which microcomputers are used in secondary and post-secondary facilities, a section of the survey instrument asked for "Yes" and "No" responses to three specific areas of utilization: Administrative, Instructional Support, and Instruction. These three categories were further divided into more specific areas. Administrative included Accounting and Finance, Analytical (visicalc or some type of electronic spreadsheet analysis), Word Processing and Other. Areas within the Instructional Support category included Generating Tests from Data Base, Teacher/Student Recordkeeping Activities (grading, attendance, etc.), Faculty Word Processing, and Other. Types of Instruction included Computer-Assisted Instruction, Computer-Managed Instruction, and Educational Simulations.

Administrative Microcomputer Activities

Secondary Vocational-Technical centers utilize microcomputers for Word Processing (60%), for Accounting and Finance (48%), and a Data Base (34%), and for Analysis (32%) (see Table 20). Only 8 percent (4) indicated other use, and 20 percent (10) did not respond.

The largest category of microcomputer use by post-secondary facilities is also Word Processing (50%), followed closely by Analysis and Data Base (37% each), and Accounting and Finance (27%). Only one indicated other uses, and five did not respond.

TABLE 20

Administrative Uses of Microcomputers

n = 80

	Secondary			Post-Secondary			
	Yes	No	No Response	Yes	No	No Response	Total
Accounting and Finance	24	24	2	8	21	1	80
Analysis	16	32	2	17	31	2	80
Data Base	17	31	2	11	18	1	80
Word Processing	30	18	2	15	14	1	80
Other	4	44	2	1	28	1	80

Use of Microcomputers for Instructional Support

Use of microcomputers for instructional support was found to be a rather weak area (see Table 21). The areas of instructional support in which microcomputers are used included generating tests - 27 percent in secondary and 30 percent in post-secondary; recordkeeping - 24 percent in secondary and 33 percent in post-secondary; faculty word processing - 20 percent in secondary and 40 percent in post-secondary. The highest percentage of use was for faculty word processing in post-secondary facilities; but less than a third of the facilities utilized microcomputers for instructional support of any other kind.

TABLE 21

Uses of Microcomputers for Instructional Support

n = 80

	Secondary			Post-Secondary			
	Yes	No	No Response	Yes	No	No Response	Total
Generate Tests	13	35	2	9	20	1	80
Record Keeping	12	36	2	10	19	1	80
Faculty Word Processing	10	38	2	12	17	1	80
Other	1			3			

Microcomputers Used for General Instructional Applications

Fifty-six percent of secondary facilities responding reported that they utilize computer-assisted instruction, while 67 percent of post-secondary facilities made use of this microcomputer capability (see Table 22). A much smaller percentage (24 percent of secondary and 40 percent of post-secondary) used computer-managed instruction.

None of the facilities indicated use of simulation software. This seems very strange since it would be through simulation that a great deal more "hands-on" learning experiences might be taught.

TABLE 22

Microcomputers Used for General Applications

n = 80

	Secondary			Post-Secondary			
	Yes	No	No Response	Yes	No	No Response	Total
Computer-Assisted Instruction (CAI)	28	20	2	20	9	1	80
Computer-Managed Instruction (CMI)	12	36	2	12	17	1	80
Educational Simulations	None for either category						

SUMMARY OF SOFTWARE NARRATIVE REMARKS - SECONDARY AREA CENTERS

Respondents were asked to provide a brief description of software that was being implemented in the general categories receiving positive reactions. Many chose not to respond to this inquiry, and those that did produced data that was difficult for the investigator to categorize for meaningful computer analysis. Therefore, a brief narrative interpretation is provided to share the limited response from an obviously poorly stated question.

Out of the fifty secondary level respondents who mailed back questionnaires, over 50 percent did not react to this part of the question at all. Many of this group did not have microcomputers, so this was appropriate; however, many who did have them merely chose not to respond.

Word processing programs of several types were the most commonly used. A few examples noted were Word Handler, Word Star, Word Pro, and Scriptsit. The next most common reaction was for other various administrative applications. VISICALC was noted several times, along with the term accounting. In some cases, accounting was identified clearly as an integral part of the business or distributive education curriculum, while in other instances it was not. Other programs, such as attendance programming and word processing programs, created similar confusion for the investigator. Computer-assisted instructional programs were noted occasionally, as were a typing tutor program, plus remedial math and reading programs.

Locally developed programs were noted by seven respondents; however, further specifics were unidentified. A similar difficult observation occurred regarding use of materials by the Minnesota Education Computor Consortium and by three others who noted Radio Shack software; again, no specifics.

The above suggests, as stated earlier, that the question on the survey instrument was poorly stated with too much ambiguity to produce a meaningful outcome. However, most of those respondents who did react, cited the

preponderance of identifiable software to be business education and administration related. Other education uses were very difficult to categorize in a uniform manner.

SUMMARY OF SOFTWARE NARRATIVE REMARKS - POST-SECONDARY

Those responding to the questionnaire for post-secondary vocational-technical facilities provided more concise remarks than the secondary respondents. However, because of the diversity of their responses and the interpretation problem associated with information from secondary facilities, the data was not entered into the computer for analysis.

Specifically, the questionnaire asked that a brief descriptor or software identifier be provided for those sub-items under Administrative, Instructional Support or Instruction receiving "yes" checkmarks. Eleven questionnaires received no remarks at all, while another six included the comment "locally produced programs." Of the six making this comment, most included one or more items identified below.

The remaining descriptors and coursework identifiers were grouped into three general categories in respect to their specificity. Group one is the most general, group two relatively more specific, and group three includes those descriptors which are most specific in regard to identifying software. The number of respondents for each item is shown in parentheses.

Group One (General)

Testing Programs (two)
Word Processing (three)
Course Bibliographies (one)
Accounting (one)
Typing Package (one)
Economics Gaming & Simulation (one)
Vocabulary/Spelling/Drill (one)
Too numerous to mention (one)

Group Two (More Specific)

Basic Compiler (one)

Minnesota Consortium (two)

Conduit CAI (one)

McGraw Hill Accounting (one)

Southwestern - Data Entry (one)

Group Three (Most Specific)

Com-Code (one)

Easy CAM/Boss VI (one)

Scriptsit (two)

Visicalc (two)

DB Master/Condor (one)

Screenwriter II (one)

TYPWRITE Program (one)

WORD PRO FOUR (one)

INFO-PRO (one)

MAGIS (one)

The above summation of remarks confirms that the question was poorly stated and did not receive a great deal of meaningful information for developing a software inventory list. It is suggested that there is a communication problem developing that must be addressed if microcomputer users are to uniformly access existing and future software resources.

IDENTIFIED SOFTWARE USE BY GROUPS WITHIN VOCATIONAL EDUCATION

The broad term "vocational education" means many things to those outside of this segment of education. However, for the purpose of survey, it was important to be considerably more specific. Therefore, in order to learn which major vocational groups were actually using microcomputer software, the questionnaire included an inquiry to determine: (1) which major groups within a facility were utilizing software; and (2) a listing of categories within these major groups.

Analysis will be broken down for each major group in alphabetical order beginning with Agriculture. Business Education Distributive Education, Health Occupations, Home Economics and Trade-Industrial and Technical will follow.

Agricultural Vocational Education

There were four area vocational centers and one post-secondary facility indicating use of microcomputer software for agriculture education curriculums. This represented six percent of those responding (see Table 23). The use of resource management applications was noted twice, agricultural production and dairy received one response each (see Table 24). Two respondents failed to identify which specific applications were appropriate within the service area of agricultural education.

Only one post-secondary vocational-technical facility provided data to identify the use of software in an agricultural program. This respondent indicated software was being utilized for a tree planting program.

Although the total amount of data for agricultural programs appears low, it is important to note that many vocational agricultural programs in Michigan are located in comprehensive high school settings. Unfortunately, the primary purpose of this investigation was to survey facilities restricted to vocational-technical programming only and did not reach many voc-ag programs.

TABLE 23

Vocational-Technical Facilities Utilizing Microcomputer Software in Agricultural Education

n = 80

	Yes Response	Percentage	Totals
Area Centers	4	8 %	50
Post-Secondary	1	3.3%	30
Total	5	6 %	80

TABLE 24

Specific Uses of Microcomputer Software in Agricultural Education

	Area Centers		Post-Secondary	
	n = 80		n = 80	
Item	Yes Responses	Percentages	Yes Responses	Percentages
Resource Management	2	4%	0	0%
Agricultural Production	1	2%	0	0%
Dairy	1	2%	0	0%
Tree Planting	0	0%	1	3.3%
Unidentified	2	4%	0	0%

Business Education

Eighty percent of the total respondents indicated use of microcomputer software in their Business Education program (see Table 25). Further analysis indicates that seventy-four percent of the secondary area centers are using software and a ninety percent utilization rate in post-secondary facilities.

Analysis for specific curriculum use within Business Education programs reveals that Word Processing ranks the highest with sixty-nine percent of the total respondent indicating use (see Table 26). Accounting software use ranks second with a forty-six percent rate of utilization. The third most popular use of software is for Data Processing with a nineteen percent rate. Two other application areas, Problem Solving and Banking, were each noted one time for an insignificant one percent rating. Four respondents (five percent) did not identify what specific application was utilized within their Business Education program of studies.

TABLE 25

Vocational-Technical Facilities Utilizing Microcomputer Software in Business Education Programs

n = 80

	Yes Response	Percentage	Totals
Area Centers	37	74%	50
Post-Secondary	27	90%	30
Total	64	80%	80

TABLE 26

Specific Uses of Microcomputer Software
in Business Education Programs

	Area Centers n = 50		Post-Secondary n = 30	
Item	Yes Response	Percentage	Yes Response	Percentage
Word Processing	29	58%	23	77%
Accounting	23	46%	14	47%
Data Processing	7	14%	5	17%
Problem Solving	1	2%	0	0%
Banking	1	2%	0	0%
Unidentified Use	3	6%	1	3.3%

Distributive Education

The combined respondents from area centers and post-secondary vocational-technical facilities indicated more than a seventeen percent software utilization rate in Distributive Education programming (see Table 27). The major use, however, is at the secondary level with twenty-four percent use versus six percent use in post-secondary facilities. It is important to note the relatively few Distributive Education programs are so identified in Michigan's community colleges, many of these programs are titled Marketing, Retailing, etc.

Microcomputer software use for specific curriculum application is predominately for Inventory Control (see Table 28). Almost fourteen percent of the total respondents indicated this application, and the great majority were identified in the area centers. The second most popular application was Accounting, with composite use at less than four percent and secondary level use at six percent. There were no applications of Accounting software in Distributive Education programs identified at post-secondary facilities. One respondent noted use of software for goals and objectives, and one respondent failed to identify a specific application.

TABLE 27

Vocational-Technical Facilities Utilizing Microcomputer Software in Distributive Education Programs

n = 80

	Yes Response	Percentage	Totals
Area Centers	12	24%	50
Post-Secondary	2	6.6%	30
Total	14	17.5%	80

TABLE 28

Specific Uses of Microcomputer Software in Distributive Education Programs

	Area Centers		Post-Secondary	
	n = 50		n = 30	
Item	Yes Response	Percentage	Yes Response	Percentage
Inventory Control	10	20%	1	3.3%
Accounting	3	6%	0	0%
Goals and Objectives	1	2%	0	0%
Unidentified	1	2%	1	3.3%

Health Occupations Education

The use of microcomputer software in Health Occupations Educational programming was predominately located in post-secondary facilities (see Table 29). Thirty percent of respondents from these facilities indicated utilization of software within their programs. Only four percent of the area centers reported their use, and the composite use for both groups of facilities was almost fourteen percent.

The three major applications indicated were Respiratory Therapy, Health Records and Diagnosis/Testing (see Table 30). Although each were reported three times, resulting in a composite analysis of almost four percent each, the preponderance of use was located in post-secondary facilities. In this analysis (post-secondary), Respiratory Therapy and Diagnostic Testing were each reported to have three applications, or ten percent of these facilities. Furthermore, Health Records were reported twice, as was Nursing, which resulted in over a six percent usage rate in post-secondary facilities. Applications for Simulation activities in Health Occupations programming was reported one time at both secondary and post-secondary vocational-technical facilities. Specific application areas were not identified by three respondents (one at secondary level and two at the post-secondary level).

TABLE 29

Vocational-Technical Facilities Utilizing Microcomputer Software in Health Occupations Education

n = 80

	Yes Response	Percentage	Totals
Area Centers	2	4%	50
Post-Secondary	9	30%	30
Total	11	13.7%	80

TABLE 30

Specific Uses of Microcomputer Software in Health Occupations Education

	Area Centers		Post-Secondary	
	n = 50		n = 30	
Item	Yes Response	Percentage	Yes Response	Percentage
Respiratory Therapy	0	0%	3	10%
Health Records	1	2%	2	6.6%
Simulation	1	2%	1	3.3%
Nursing	0	0%	2	6.6%
Diagnosis/Testing	0	0%	3	10%
Unidentified	1	2%	2	6.6%

Home Economics Education

Data collection for this particular aspect of vocational education programming was particularly disappointing to the investigator for the following reason. Subsequent to instrument design and mailing, a visit to the Vocational-Technical Education Services (V-TES) office, in Lansing, Michigan, revealed that a great deal of activity and statewide leadership was being coordinated for this particular service group (e.g., Home Economics). Much available software had already been reviewed and evaluated with recommendations for use in consumer home economics curriculums.

The reason for lack of resultant data (see Tables 31 and 32) is similar to that noted for Agricultural vocational programming in Michigan; that is, many of the Home Economics programs are also located in comprehensive high school facilities. Therefore, since the basic purpose of this investigation was to survey the use of microcomputers in those facilities not containing academic education programs, the instrument failed to reach these two major vocational service groups in Michigan's schools.

The small percentage (less than four percent) of respondents identifying use of the software illustrates applications in area centers and post-secondary facilities only. The only identified application was Food and Nutrition at an area center. Two unidentified applications were noted at the post-secondary level.

TABLE 31

Vocational-Technical Facilities Utilizing Microcomputer Software in Home Economics Programs

n = 80

	Yes Response	Percentage	Totals
Area Centers	1	2%	50
Post-Secondary	2	6.6%	30
Total	3	3.8%	80

TABLE 32

Specific Uses of Microcomputer Software in Home Economics Education

	Area Centers		Post-Secondary	
	n = 50		n = 30	
Item	Yes Response	Percentage	Yes Response	Percentage
Food and Nutrition	1	2%	0	0%
Unidentified	0	0%	2	6.6%

Trade-Industrial and Technical Education

Forty-one percent of the total respondents indicated microcomputer software applications in a wide variety of trade-industrial and technical education currriculums (see Tables 33 and 34). More detailed analysis illustrates that thirty-two percent of the secondary area facilities are utilizing software while almost fifty-seven percent of post-secondary units have application areas.

The analysis for specific uses indicates Problem Solving to be the dominating application descriptor with a twenty-two percent use in the area centers and over forty-six percent at the post-secondary level. The composite rating is over thirty-one percent. The next most popular applications are Computer-Assisted Design and Computer Graphics. Each received four responses from secondary respondents and seven responses from post-secondary. The composite of eleven responses from all facilities computes to an almost fourteen percent utilization rate for each application.

The third most popular use is within the Graphic Arts/Printing curriculums at the area centers. Eight responses from this group of facilities indicates sixteen percent utilization. There were no responses in this category from post-secondary units. The composite rating is ten percent. At this point there is a significant decrease in the number of responses from the remaining identified application areas with computer assisted manufacturing ranking fourth. Curriculum applications in Electrical/Electronics were noted one time each in secondary and post-secondary facilities. At the post-secondary level, Robotics and Computer Information Technology each received one response. There were no unidentified uses noted in the overall category for Trade-Industrial and Technical education.

TABLE 33

Vocational-Technical Facilities Utilizing Microcomputer Software in Trade-Industrial and Technical Programs

n = 80

	Yes Response	Percentage	Totals
Area Centers	16	32%	50
Post-Secondary	17	56.6%	30
Total	33	41.2%	80

TABLE 34

Specific Uses of Microcomputer Software in Trade-Industrial and Technical Education

	Area Centers n = 50		Post-Secondary n = 30	
Item	Yes Response	Percentage	Yes Response	Percentage
C.A.D.	4	8%	7	23.3%
C.A.M.	1	2%	4	13.3%
Graphics	4	8%	7	23.3%
Graphic Arts/Printing	8	16%	0	0%
Electrical/Electronics	1	2%	1	3.3%
Robotics	0	0%	1	3.3%
Computer Information Technology	0	0%	3	10%
Problem Solving	11	22%	14	46.6%
Unidentified	0	0%	0	

Part III

Vocational Education Software Guide

This abbreviated vocational education software index is intended to provide potential and current microcomputer users in Michigan a reference point with respect to search activities. The ten major sources from which the index was developed represents published software guides, nationally available computer data bases, state and local reference materials.

Its format is arranged by vocational education service groups and identifies the following: title, required microcomputer hardware, source where more information can be obtained, disk or cassette, and approximate cost. Two service groups (Agriculture and Home Economics), which are not normally serviced by the Center for Occupational Education, are treated differently from the others. Agricultural educators are advised to go to regional sources such as the North Central Computer Institute located at the University of Wisconsin. This institute supports member Institution Cooperative Extension Services, Agricultural Experiment Stations, and resident instruction. A primary institute objective is to foster the development of multi-state and multi-discipline computer software.

The data cited for Home Economics educators is taken from the Michigan V-TES Consumer Home Economics Software/Courseware Resource Guide compiled by Dr. B. A. Atkins. Much of this material has been previewed and recommended for educational use by the Consumer Home Economics Unit.

Please note that all other material contains no endorsement of quality or appropriateness to curriculum. It is merely a title listing to aid in search activities.

Source Index Number	Source Title
1	Radio Shack Software Sourcebook, Vol. IV
2	S P I F (Computer Data Base)
3	E R I C (Computer Data Base)
4	R I C E (Computer Data Base)
5	International Software (Computer Data Base)
6	Microcomputer Index (Computer Data Base)
7	The Blue Book for the Apple Computer - 2nd Edition
8	Van Loves Apple II/III Software Directory
9	Consumer Home Economics Guide Software/Courseware Resources (Michigan Vocational-Technical Services)
* 10	Tri-County Computer Consortium (Oakland Schools, Macomb and Wayne County Intermediate School Districts)

* See project description on next page.

DESCRIPTION OF TRI-COUNTY COMPUTER CONSORTIUM

The Tri-County Computer Consortium is composed of representatives from Macomb Intermediate School District, Oakland Schools, and Wayne County Intermediate School District. These Michigan regional service agencies support a total of 85 school districts and over 150 private schools. They provide computing support to an educational environment of 1,000 timeshare terminals and 2,500 microcomputers. The consortium was formed to coordinate resources to facilitate projects such as this public domain software collection.

Rationale

In a response to numerous requests from constituent districts, the TCC took up the task in the Fall of 1980 to organize a project to collect, annotate and repackage public domain software. The Consortium representatives are aware of the lack of quality software available in the public domain. The process which was applied to the software collection, annotation and repackaging was viewed by the TCC as a preliminary step to the evaluation and documentation of meritorious software. The collection that follows represents not the best available software, but rather the survivors of the technical review (Does it run?) and a cursory education review (Does it have educational value?). The programs in this users guide were examined for copyright statements and, to the best of the reviewers' knowledge, were found to reside in the public domain. If the user discovers a program which is known to be copyrighted, please notify your county's Consortium representative. As a consortium, our next step will be to evaluate each program, and select the best for packaging with educational materials which will enable teachers to use them effectively in the classroom.

VOCATIONAL EDUCATION SOFTWARE GUIDE

SERVICE AREA: Agriculture

Title	Hardware	Source or Data Base	Disk (D) or Cassette (C)	Approx. Cost
N.A.	N.A.	N.A.	N.A.	N.A.

Search activities indicated that there is a tremendous amount of software available, however, it was difficult for the investigator to deterine by title review which items should be listed. It was discovered that organizations and Data Bases were already in existence to serve this vocational service group.

Four such sources were recommended by agriculture education personnel:

1. North Central Computer Institute, University of Wisconsin
2. MICRO AG, Route 1, Princeton, Iowa
3. Specialized Data Systems, Inc., Madison, Wisconsin
4. Minnesota Educational Computer Consortium, St. Paul, Minnesota

VOCATIONAL EDUCATION SOFTWARE GUIDE

SERVICE AREA: Business Education

*Source 1 Hardware - Minimum requirement as noted by Radio Shack

Title	Hardware	Source or Data Base	Disk (D) or Cassette (C)	Approx. Cost
Cassette Business Package Mod I & III	TRS 80 I & III (min)*	1	C	$60.00
Bookkeeping - Adv. Course	TRS 80 I & III	1	C D	$50.00
Bookkeeping - Basic Course #1	TRS 80 I & III	1	C D	$50.00
Bookkeeping - Basic Course #2	TRS 80 I & III	1	C D	$50.00
Business Basic Problems	TRS 80 III	1	D	$25.00
Business Package I	TRS 80 I	1	C D	$25.00
Business Package II	TRS 80 I	1	C D	$25.00
Business Package III	TRS 80 I	1	C D	$25.00
FBASE: Fund Accounting	TRS 80 II	1	D	Quote
Filing Rules	TRS 80 I	1	C D	$20.00
Lemonade: The Game of Big Business	TRS 80 I & III	1	C	$20.00
Letter/Report Writer Program	TRS 80 I & III	1	C D	$20.00
Stock Market Monitor	TRS 80 I & III	1	C D	$100.00
Typing Teacher	TRS 80 I	1	C	$10.00
Typing Tutor	TRS 80 I	1	C	$15.00
Typing Tutor - In Color	TRS 80 - Color	1	D	$30.00

VOCATIONAL EDUCATION SOFTWARE GUIDE

SERVICE AREA: Business Education (continued)

*Source 1 Hardware - Minimum requirement as noted by Radio Shack

Title	Hardware	Source or Data Base	Disk (D) or Cassette (C)	Approx. Cost
Typist - Teach, Drill, Test	TRS 80 II	1	D	$40.00
Cisero Word Processor for Line Printer	TRS 80 I	1	D	$125.00
Electronic Typewriter	TRS 80 I & III (min)*	1	C D	$10-$13.00
Letter Writer I	TRS 80 I	1	C	$40.00
Letter Writer II	TRS 80 I	1	C	$30.00
Letter/Report Writer Program	TRS 80 I & III	1	C D	$18.00
TX Mode Word Processing System	TRS 80 I & III	1	C	$30.00
Word Organizer	TRS 80 II	1	D	$50.00
Word Processing - Computerized Typing $60.00	TRS 80 I	1	D	
Word Processor 'Print Command 80'	TRS 80 III	1	C	$25.00
Word Processor - Mod III Color	TRS 80 III	1	C D	$25-$30.00
Word Processor for Personal/Business Use	TRS 80 I & III	1	C D	$25-$30.00
Word Processor for the Color Computer	TRS 80 - Color	1	C	$25.00
Word Processor for the Color Computer	TRS 80 - Color	1	C	$30.00

SERVICE AREA: Business Education (continued)

Title	Hardware	Source or Data Base	Disk (D) or Cassette (C)	Approx. Cost
Word Processor Mod II - Full Screen	TRS 80 II	1	D	$150.00
WRD Pro - Word Processor	TRS 80 I	1	C D	$30-$50.00
WRITSIT	TRS 80 III	1	D	$60.00
Payroll		3		
Carbuying		3		
T-Accounts	TRS 80	4	C D	$20.00
Steno	TRS 80	4	D	$25.00
10-Key Drill	TRS 80	4	D	$20.00
Business - Vol I	Apple II	4	D	$30.00
Business - Vol II	Apple II	4	D	$30.00
Business - Vol III (Accounting)	Apple II	4	D	$30.00
Typing	Apple II	4	D	$20.00
Business I	TRS 80 I	4	C	$10.00
Business II	TRS 80 I	4	C	$10.00
Typing Teacher	Apple II	4	D	$20.00
Typing Tutor	Apple II, TRS 80 I	4 & 6	C D	$25.00
Typemaster	Apple II	4	D	$60.00
Job Readiness - Assessment and Development	Apple II	4	D	$165.00
Market	Apple II, TRS 80	6	-	--
Lemonade Stand	Apple II	6	-	--

SERVICE AREA: Business Education (continued)

Title	Hardware	Source or Data Base	Disk (D) or Cassette (C)	Approx. Cost
Six Business Management Games	--	6	-	--
Mastertype	Apple II	6	-	--
Hi-Res Master Type	Apple II	6	-	--
Personal Secretary Package	Apple II	7	D	$30.00
Agenda Files	Apple II	7	D	$35.00
The Appointment Calendar	Apple II	7	-	$100.00
Personnel Office	Apple II	7	D	$60.00
Appointments	Apple II	7	-	$75.00
Office Manager	Apple II	7	D	$100.00
Business Tools	Apple II	7	-	$170.00
Micro Memo	Apple II	7	D	$40.00
Money Management Assessment Series	Apple II	7	D	$165.00
The Executive Secretary	Apple II	7	-	$250.00
Versaform	Apple II	7	-	--
Business Applications	Apple II	7	D	$70.00
Magicalc	Apple II	7	-	--
Word Processing (approximately 50 programs categorized under Word Processing)	Apple II	7	-	--

SERVICE AREA: Business Education (continued)

Title	Hardware	Source or Data Base	Disk (D) or Cassette (C)	Approx. Cost
Account Keeper	Apple II	8	D	$119.95
Apple Champ (Checkbook Advanced Management Program)	Apple II	8	D	$28.95
Business Software Series	Apple II	8	D	$199.95
Client Records/Bill Preparation	Apple II	8	D	$49.95
Financial Partner	Apple II	8	D	$245.00
General Ledger	Apple II	8	D	$350.00
No-Nonsense Books	Apple II	8	D	$225.00
Paymaster	Apple Ii	8	D	$119.95
Payroll	Apple II	8	D	$50.00
Appointments	Apple II	8	D	$75.00
Business Package I	Apple II	8	D	$24.95
Business Package III	Apple II	8	D	$24.95
Cashmaster	Apple II	8	D	$289.00
Easy Form	Apple II	8	D	$100.00
Letteright	Apple II	8	D	$200.00
Form Letter	Apple II	8	D	$24.95
Magic Window	Apple II	8	D	$99.95
The Personal Secretary	Apple II	8	D	$100.00

SERVICE AREA: Business Education (continued)

Title	Hardware	Source or Data Base	Disk (D) or Cassette (C)	Approx. Cost
Word Processing	Apple II	8	D	$70.00
Apple Post	Apple II	8	D	$49.95
Apple Sack 5 - Mail Sack	Apple II	8	D	$24.95
Disk Mailing List	Apple II	8	D	$25.00
Label Maker	Apple II	8	D	$35.00

VOCATIONAL EDUCATION SOFTWARE GUIDE

SERVICE AREA: Distributive Education

*Source 1 Hardware - Minimum requirement as noted by Radio Shack

Title	Hardware	Source or Data Base	Disk (D) or Cassette (C)	Approx. Cost
Cash-Register Oriented Inventory	TRS 80 I (min)*	1	D	$495.00
Store		3	-	--
Job Readiness - Assessment and Development	Apple II	4	D	$165.00
The Order Schedule	Apple II	7	D	$150.00
Order Tracking System	Apple II	7	D	$50.00
Tracking	Apple II	7	D	--
Magicalc	Apple II	7	D	--
Retail Management System	Apple II	7	-	$40.00
The Store Manager	Apple II	7	-	$250.00
Cash Master	Apple II	7	-	$225.00
Electronic Price-Sheet	Apple II	7	D	$100.00
Retail Manager	Apple II	7	-	$295.00
Micro-Inventory	Apple II	8	D	N/A
The Cashier	Apple II	8	D	$250.00
The Store Manager	Apple II	8	D	$250.00

VOCATIONAL EDUCATION SOFTWARE GUIDE

SERVICE AREA: Health Occupations

*Source 1 Hardware Minimum requirement as noted by Radio Shack

Title	Hardware	Source or Data Base	Disk (D) or Cassette (C)	Approx. Cost
(Medical Datums) Medical/Clinics/ Labs	TRS 80 II (min)*	1	D	$4,500.00
Dental/Medical Inventory Control	TRS 80 II	1	D	$50.00
Dental Assistance System	TRS 80 II	1	D	$2,000.00
Dental Assistant 1982 (2)	TRS 80 III	1	D	$600-$900.00
Dental Lab IV - Dental Lab Management	TRS 80 II	1	D	$2,000.00
Job Readiness - Assessment and Development	Apple II	4	D	$165.00

VOCATIONAL EDUCATION SOFTWARE GUIDE

SERVICE AREA: Home Economics

Title	Hardware	Source or Data Base	Disk (D) or Cassette (C)	Approx. Cost
Budgeting	Apple II Plus TRS 80 III	9	D	$55.00
Budget Simulation	Apple II Plus TRS 80 III	9	D	$55.00
Income Meets Expenses	Apple II Plus	9	D	$55.00
You Can Bank On It	Apple II Plus	9	D	$315.00
Money Management Assessment	Apple II Plus	9	D	$182.00
Personal Finance Library	Apple II	9	D	$749.95
Buying Wisely	Apple II	9	D	$44.95
Becoming an Informed Shopper	Apple II	9	D	$44.95
Understanding Sales Buying	Apple II	9	D	$44.95
Cash Versus Credit Buying	Apple II	9	D	$44.95
Comparative Buying	Apple II Plus	9	D	$182.00
Shopper	PET/TRS 80	9	C D	$20.00
Advertising Techniques	Apple II	9	-	$24.95
Job Readiness - Assessment and Development	Apple II	9	D	$182.00
Nutrition	Apple II Plus TRS 80 III	9	D	$80.00
Nutrition Simulation	Apple II Plus TRS 80 III	9	D	$55.00
Dinner's On	PET/TRS 80	9	C D	$15.00

SERVICE AREA: Home Economics (continued)

Title	Hardware	Source or Data Base	Disk (D) or Cassette (C)	Approx. Cost
Grocery Mart	PET/TRS 80	9	C D	$15.00
Eat for Health	PET/Apple II Plus Apple II E	9	D	$25.00
Home Safe Home	Apple II	9	D	$165.00
Poison Proof Your Home	Apple II	9	D	$210.00
Energy Czar	Atari 400 & 800	9	-	$15.95
Decorator's Assistant	PET	9	-	$7.95
Basic First Aid	PET	9	D	$19.95
Reproduction	Apple II	9	D	$29.95
Know Yourself	Apple II	9	C D	$11.95

VOCATIONAL EDUCATION SOFTWARE GUIDE

SERVICE AREA: Trade-Technical

*Source 1 Hardware - Minimum requirement as noted by Radio Shack

Title	Hardware	Source or Data Base	Disk (D) or Cassette (C)	Approx. Cost
Basics of Servo-mechanisms and O P Amps	TRS 80 I (min)*	1	C	$15.00
Electrical Analysis I	TRS 80 I	1	C	$20.00
Electrical Circuits I	TRS 80 I	1	C D	$10-$15.00
Electronic Formulas	TRS 80 I	1	C	$8.00
Electronics I	TRS 80 I	1	C	$8.00
Home Construction Cost Breakdown & Analysis	TRS 80 I	1	C D	$35-$45.00
Job Costing for Building Contractors	TRS 80 III	1	D	Quote
Electrical Wiring for Home and Farms	TRS 80 I	1	C	$15.00
Concrete and Blocks for Home and Farms	TRS 80 I	1	C	$15.00
Ohms Law	TRS 80 I	1	C	$8.00
Aircraft Weight & Balance	TRS 80 I	1	C	$10.00
Aviation Software Vols. 1-5	TRS 80 II & III	1	C D	$11-$16.00
Basic Electronics	TRS 80 I & III	1	C	$20.00
Capacitance Meter (D.C.)	TRS 80 I	1	C	$40.00
Color T.V. Repair	TRS 80 I	1	C	$13.00
Graphic Aide 1-4	TRS 80 I & III	1	C	$8.00
Graphic Design 1	TRS 80 I	1	C	$18.00

SERVICE AREA: Trade-Technical (continued)

*Source 1 Hardware - Minimum requirement as noted by Radio Shack

Title	Hardware	Source or Data Base	Disk (D) or Cassette (C)	Approx. Cost
Electronic Components	TRS 80 I & III (min)*	1	C D	$15.00
Electronic L-C Filter Parametric Design	TRS 80 I & III	1	C D	$15.00
Robotics - Robot Simulation on a Computer	TRS 80 I	1	C	$15.00
Drawing Board	TRS 80 II & III	1	C D	$25-$30.00
Rotating Graphics	TRS 80 II & III	1	C D	$35.00
Aircraft Maintenance	TRS 80 II	1	D	$400.00
Aircraft Maintenance System	TRS 80 II	1	D	$995.00
Alternating Current Circuit Analysis	TRS 80 I	1	C	$16.00
Camera Repair - Troubleshooting AE - 1	TRS 80 I	1	C	$16.00
Ceramic Glaze Formulation	TRS 80 PKT-1	1	C	$20.00
Cimcon Heat Load Calculation	TRS 80 I (Disk)	1	D	$500.00
Commercial Cooling and Heating Load CL4M	TRS 80 I (Disk)	1	D	$1,000.00
Commercial HVAC Load Calculations	TRS 80 III	1	D	$750.00
Concrete Beam Design	TRS 80 II	1	D	$475.00

VOCATIONAL EDUCATION SOFTWARE GUIDE

SERVICE AREA: Trade-Tecnical (continued)

*Source 1 Hardware - Minimum requirement as noted by Radio Shack

Title	Hardware	Source or Data Base	Disk (D) or Cassette (C)	Approx. Cost
Concrete Column Design (2)	TRS 80 II	1	D	$300.00
Concrete Flat Slab Design	TRS 80 II	1	D	$625.00
Concrete Take-Off	TRS 80 I	1	D	$200.00
Construction Wood Beam/Trusjoint Design	TRS 80 I	1 (min)*	C D	$65-$70.00
Continuous Beam Analysis	TRS 80 I	1	C	$300.00
Continuous Beam Program	TRS 80 II	1	D	$250.00
Electronic Active Filters	TRS 80 I	1	C	$20.00
Electronic Circuit Analysis	TRS 80 I	1	C D	$70-$75.00
Electronic Circuit Designer	TRS 80 I	1	C	$40.00
Electronic Multiple Pole Active Filters	TRS 80 III	1	D	$35.00
Electronic AC & DC Circuit Analysis	TRS 80 I	1	C	$18.00
Energy	TRS 80 PKT-1	1	C	$250.00
Graphic Arts Film Exposure Program	TRS 80 III	1	C	$100.00
Graphics Editor	TRS 80 I	1	D	$30.00
Lumber Material Takeoff	TRS 80 I	1	C D	$50-$60.00

SERVICE AREA: Trade-Technical (continued)

*Source 1 Hardware - Minimum requirement as noted by Radio Shack

Title	Hardware	Source or Data Base	Disk (D) or Cassette (C)	Approx. Cost
Machine Shop Geometry	TRS 80 1	1	C	$25.00
Mason's Brick Estimator	TRS 80 I	1	C D	$200.00
Offset Printing Estimator	TRS 80 I	1	D	$20.00
Ohms Law Calculator	TRS 80 III	1	C	$15.00
Printer's Microcomposer	TRS 80 I	1	D	$1,500.00
Printers Estimate (5)	TRS 80 II	1	D	$500-$1,400.00
Printing - The Exposure Computer	TRS 80 PKT-1 (min)*	1	C	$300.00
Restaurant Management (4)	TRS 80 I	1	C D	Quote
Simple Circuits	Commodore-Pet	2	C D	$25.00
Generators and Motors	Commodore-Pet	2	C D	$25.00
Electromagnetic Induction	Commodore-Pet	2	C D	$25.00
Magnetic Effect	Commodore-Pet	2	C D	$25.00
Magnetic Fields	Commodore-Pet	2	C D	$25.00
Nature of Magnetism	Commodore-Pet	2	C D	$25.00
Electric Power and Energy	Commodore-Pet	2	C D	$25.00
Conservation of Charge & Energy	Commodore-Pet	2	C D	$25.00
Conductivity	Commodore-Pet	2	C D	$25.00

SERVICE AREA: Trade-Technical (continued)

*Source 1 Hardware - Minimum requirement as noted by Radio Shack

Title	Hardware	Source or Data Base	Disk (D) or Cassette (C)	Approx. Cost
Static Electricity and the Electroscope	Commodore-Pet	2	C D	$25.00
Electrolytic Cells	Commodore-Pet	2	C D	$25.00
Electrochemistry	Commodore-Pet	2	C D	$25.00
Electricity and Magnetism	Apple II	2	D	$12.00
Basic Electricity	Apple II	2	D	$22.00
Basic Electricity: Series, Parallel and Network	Apple II	2	C D	$50.00
Electric Field Analysis	Commodore-Pet	2	C D	$20.00
Series/Parallel Circuit Analysis	Commodore-Pet	2	C D	$20.00
Parallel Circuit Analysis II	Commodore-Pet	2	C D	$20.00
Parallel Circuit Analysis I	Commodore-Pet	2	C D	$20.00
Series Circuit Analysis	Commodore-Pet	2	C D	$20.00
Electronic Circuit Designer Package	TRS 80 I & III	2	C	--
Electronics: Metric Quiz	TRS 80 I & III	2	C D	$25.00
Job Readiness - Assessment and Development	Apple II	4	D	$165.00
Op-Amp Design	Apple II	7	-	$17.00
Microcomputer Circuit Analysis	Apple II	7	-	$25.00

SERVICE AREA: Trade-Technical (continued)

Title	Hardware	Source or Data Base	Disk (D) or Cassette (C)	Approx. Cost
Fourier Analyzer	Apple II	7	C D	$20-$24.00
Freqout	Apple II	7	-	$50.00
Electricity	Apple II	7	D	$30.00
Circuit Analysis	Apple II	7	D	$40.00
Basic Electricity - Series Parallel, Network	Apple II	7	-	$50.00
Frequency Counter	Apple II	7	C	$15.00
Basic Electricity	Apple II	7	D	$22.00
Mentor (Electronic Design for the Apple)	Apple II	7	-	$125.00
Electronics I	Apple II	7	C D	$25-$30.00
Electronics II	Apple II	7	C D	$25-$30.00
Electronics III	Apple II	7	C D	$25-$30.00
Active Filter Design	Apple II	7	-	$22.00
Uni-Solve - The Electronic Designer	Apple II	7	C D	$20-$25.00
Wiremaster	Apple II	7	-	$150.00
Amateur Radio and Electronics	Apple II	7	D	$35.00
Solar Energy for the Home	Apple II	7	D	$35.00
Spur Gears	Apple II	7	-	$35.00
Beams	Apple II	7	-	$115.00

SERVICE AREA: Trade-Technical (continued)

Title	Hardware	Source or Data Base	Disk (D) or Cassette (C)	Approx. Cost
Stress and Strain on Micro-computers	Apple II	7	Pkg.	$50.00
Statics on Microcomputers	Apple II	7	Pkg.	$50.00
Pier and Grade Beam Design	Apple II	7	Pkg.	$170.00
Architectural Specification	Apple II	7	D	$250.00
Retaining Wall Design	Apple II	7	Pkg.	$275.00
Isolated Footing Design	Apple II	7	Pkg.	$130.00
Graphics (over 100 programs applicable to the broadest definition of Graphics)	Apple II	7	-	--
Introductory Mechanics	Apple II	7	D	$45.00
Gas Laws	Apple II	7	D	$30.00
Mechanics and Motion	Apple II	7	D	$30.00
Resistor Color Code Decoder	Apple II	10	D	Public Domain
Resistor Color Code Quiz	Apple II	10	D	Public Domain
Ohm's Law	Apple II	10	D	Public Domain
Ohm's Law Formula	Apple II	10	D	Public Domain
Tolerance Calculator	Apple II	10	D	Public Domain

SERVICE AREA: Trade-Technical (continued)

Title	Hardware	Source or Data Base	Disk (D) or Cassette (C)	Approx. Cost
Electronics Calculator	Apple II	10	D	Public Domain
Reactance Calculations	Apple II	10	D	Public Domain
Inductance - Capacitance Program	Apple II	10	D	Public Domain
Electronic Design Calculations	Apple II	10	D	Public Domain
Power Supply & Filter Calculations	Apple II	10	D	Public Domain
Zener Diode Regulator	Apple II	10	D	Public Domain
Audio Designer	Apple II	10	D	Public Domain
Airfoil (Simulation)	Apple II	10	D	Public Domain
Antenna L Networks	Apple II	10	D	Public Domain
Camera Demonstration (Simulation)	Apple II	10	D	Public Domain
Conduit Fill	Apple II	10	D	Public Domain
Engine (Simulation)	Apple II	10	D	Public Domain
Loop Antenna	Apple II	10	D	Public Domain
Notch Filter	Apple II	10	D	Public Domain
Piston Engine Demonstration (Simulation)	Apple II	10	D	Public Domain
Progressions	Apple II	10	D	Public Domain

SERVICE AREA: Trade-Technical (continued)

Title	Hardware	Source or Data Base	Disk (D) or Cassette (C)	Approx. Cost
Transistor Parameters	Apple II	10	D	Public Domain
X-Line Impedance	Apple II	10	D	Public Domain
Imput Amplifier	Apple II	10	D	Public Domain
I C Timer	Apple II	10	D	Public Domain
Timer (555) Design PGM	Apple II	10	D	Public Domain
I C Tone Decoder	Apple II	10	D	Public Domain
Active Filter Design System	Apple II	10	D	Public Domain
Bandpass Active Filter	Apple II	10	D	Public Domain
Low-Pass Active Filter	Apple II	10	D	Public Domain
High-Pass Active Filter	Apple II	10	D	Public Domain
Network L Design	Apple II	10	D	Public Domain
PI - Net and Coil Design	Apple II	10	D	Public Domain
T.V. Convergence	Apple II	10	D	Public Domain
Arc Welding	TRS 80	10	D	Public Domain
Arc Welding Quiz	TRS 80	10	D	Public Domain
Resistor	TRS 80	10	D	Public Domain
Color Resistor	TRS 80	10	D	Public Domain
Job Cost Program	TRS 80	10	D	Public Domain
Studs	TRS 80	10	D	Public Domain
Bill of Materials	TRS 80	10	D	Public Domain

MAJOR FINDINGS

- There are two microcomputer manufacturers (Apple and Radio Shack) that are most commonly found among the current hardware inventories in Michigan's vocational-technical facilities.

  Note: There is also a significant number of Commodore-Pet microcomputers included in the total inventory.

- Should anticipated microcomputer hardware purchases be made for the school year 1983-84 a third manufacturer (IBM) will compete very closely with Apple and Radio Shack for distribution among Michigan's vocational-technical facilities.

  Note: The total number of Commodore-Pet units is not expected to maintain its significant inventory rating.

- Networking of microcomputers, both to one another and/or access to a mainframe, is currently being done in twenty-five percent of the facilities. This percentage is expected to double in the near future.
- Administrative and Business Education curriculum applications of microcomputers dominates all other uses in Michigan's vocational-technical facilities. Word processing and accounting are the most popular specific applications.
- Michigan's vocational-technical microcomputer hardware inventory is expected to increase by almost sixty percent in 1983-84. The preponderance of this increase will be in post-secondary facilities.
- The use of microcomputers for instructional support services (generating tests, record keeping and faculty word processing) is generally weak.
- While there is a significant amount of activity in Computer Assisted Instructional applications with microcomputers, there are relatively few applications in Computer Managed Instruction. Most disturbing is the absence of identified microcomputer simulation activities.

. Business Education and Trade-Industrial and Technical Education are the major instructional application areas in Michigan's vocational-technical facilities.

Note: Many Agriculture and Home Economics programs located in comprehensive high schools were not included in this investigation.

. Identification of software utilized for various applications was very difficult to acquire from respondents. A brief and diverse listing emerged with little apparent value.

. It appears that a great deal of hardware acquisition has occurred without thorough investigation of appropriate software programming available. This observation is especially applicable to overall instructional applications in vocational programming.

RECOMMENDATIONS

- There is need for considerable teacher training in both basic computer literacy and a thorough understanding of the broader implications with respect to "user friendly" microcomputer technology and the instructional process.
- There is a strong and immediate need to develop and maintain a software data base which clearly identifies applications for vocational curriculums and the necessary hardware. It is suggested this be pursued on a statewide basis with the ultimate capability or networking nationally with other similiar emerging statewide data bases.
- An annual microcomputer hardware inventory modeled after this investigation should be continued. This would assist users and potential users in making decisions with respect to the purchase of microcomputer hardware and software.
- An annual assessment of microcomputer software applications for administration and instruction would be very beneficial. It is recommended that either revisions be made to the instrument used in this investigation, or design a new instrument if such an assessment is pursued.
- There is need to develop some type of rating or assessment system for available software having appropriate applications to vocational education curriculums.

  Note: The National Center for Research in Vocational Education is planning to investigate this problem area in the immediate future.

- Development of a high visibility microcomputer awareness program for all vocational educators is needed. The major goal is increased awareness of the proliferation of this advanced technology throughout vocational instructional programming and administrative services.